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BOVINE CAESAREAN SECTION*

Observations on the Different Approaches

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Perusal of the available literature fails to reveal much pertinent information on the comparison between the various approaches. From observations based upon 42 operations which the writer has performed within the past three years, it is hoped to indicate the advantages and disadvantages of the different sites of operation.

The operation may be performed with the animal in either the recumbent or the standing position.

OPERATION WITH THE PATIENT RECUMBENT

SELECTION OF THE APPROACH

In the standing position only the familiar upper flank incision with a ventralwards extension is possible but in the recumbent operation any approach may be made.

If we consider the abdomen in the standing quadruped to consist of upper and lower segments, the upper and lower flank incisions will be found largely within the confines of the corresponding segment. These incisions are made in a direction almost, if not quite, perpendicular to the long axis of the body, though Straiton (1945) incises the tissues parallel to and approximately 4 inches from the last rib and Glenney's (1939) incision extends from a point halfway between the external angle of the ilium and the posterior border of the last rib, obliquely downwards and forwards to the posterior border of the sternum. The lower abdominal approach, for the purpose of this work, entails an incision in a direction parallel to the long axis of the body on the ventral aspect of the abdomen. Generally speaking, it may be said that a flank incision is made on the side of the abdomen while a lower abdominal incision is made on the floor of the abdomen.

A survey of the available literature shows that the majority of workers who have published case reports on the subject prefer what the author terms the "upper flank" approach, but personal contact with several veterinarians shows that the lower abdominal approach is becoming more popular —no doubt due to the reports published in its favour by Gotze (1928), Frank and Roberts (1940) and Wright (1949).

In the writer's view, there is no constant "best" approach, each approach and each site within the selected approach having both advantages and disadvantages. Each case must be treated on its merits and the site selected which will best serve the subject under consideration. Intellectually wealthy is the man who can afford to wander in the realms of dogmatism, hence the comparison rather than the emphatic assertion in this paper.

* Part of an address to the Colorado V.M.A., Colorado Springs, September 27th, 1951.

THE FLANK APPROACH

This may be divided into an upper and lower approach. In the series of cases under consideration the *upper flank incision* extends from a point 3 to 4 inches below the lumbar transverse processes in an almost vertical direction for a distance of some 12 inches and passes through the centre of the sublumbar fossa. The incision passes through the following tissues: skin, m. cutaneous trunci, fascia, elastic abdominal tunic, deep to and intimately connected with which is a layer of fat of variable thickness, m. obliquus abdominis externus, m. obliquus abdominis internus, m. transversus abdominis and peritoneum. Among the workers who utilise the upper flank approach may be mentioned Smythe (1941), Straiton (1945), Glenney (1939) and Gendreau (1947).

The *lower flank incision* commences approximately 14 inches below the lumbar transverse processes in the centre of the sublumbar fossa, continues vertically downwards for some 12 inches and ends just dorsal to the mammary vein. In order to avoid severing the fold of the flank (here formed by the m. cutaneous trunci) it is sometimes necessary to make the incision as already described but with a downward and forward bias. If the fold of the flank is incised at its thickest part delayed healing will be the rule rather than the exception. The incision passes through the following tissues: skin, m. cutaneous trunci, elastic abdominal tunic, m. obliquus abdominis externus, m. obliquus abdominis internus, m. transversus abdominis, m. rectus abdominis and peritoneum.

No reference has been found in the literature to the lower flank approach* but the writer's experience of this method in 18 operations prompts him to regard it as worthy of consideration. It is readily appreciated that in a small heifer carrying a large calf, the incision necessary to permit effective delivery may well be a "combined" upper and lower flank incision.

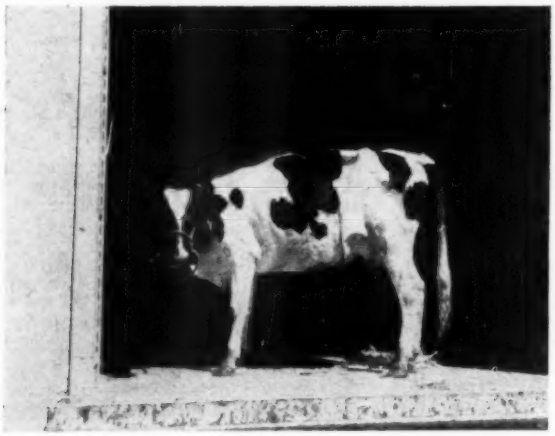
In both upper and lower sites, the surgeon has the choice of right or left side. In the case of the left side, after incision of the peritoneum, it will be found that the rumen tends to hinder the elevation of the uterus, the extent of the hindrance being in direct proportion to the amount of ingesta or fermentation present in the rumen at the time of operation. In the recumbent subject, cases have been encountered where the fullness of the rumen would almost certainly have prevented the raising of the gravid horn to the abdominal incision. Jesperson (1933), using this left side approach, points out that the uterus was located with difficulty, but this does not apply to the same extent when the operation is performed in the standing position.

In the right side approach, instead of the rumen one has to contend with the small intestine, but it is easier to elevate the uterus between the coils of intestine than it is to repel a heavy organ such as the rumen when lateral recumbency of the patient is employed.

A question often asked is: "Should the abdominal incision be made on the same side as the gravid horn?" The answer would appear to be "Not necessarily," since

* This article was dispatched prior to the receipt of your issue of December 29th, from which I note that Mr. G. N. Gould is an advocate of this method of approach.

the gravid horn can usually be easily reached from either side. Ideally speaking, however, the writer considers that for easy access to the uterus, the abdominal incision should be made over the point where the foetus can be palpated from the exterior.



Case 1-2575, taken 36 hours after operation, showing the lower left flank approach.

Case 1-2912, showing the lower right flank approach. The size of this 18-month-old heifer may be judged by the height of the attendant—5 feet 11 inches.

The Lower Abdominal Approach

In this approach there are five possible sites :—

1. Right side, lateral to the right milk vein.
2. Right side, between the right milk vein and the mid-line.
3. The mid-line, through the linea alba.
4. Left side, between the mid-line and the left milk vein.
5. Left side, lateral to the left milk vein.

Of these five approaches only the first-mentioned site has not, to the writer's knowledge, been used. *The lateral-to-the-milk-vein incision* is made parallel to and 3 to 4 inches lateral to the vein and extends for a distance of some 12 to 14 inches. The incision passes through the following tissues : skin, m. cutaneous trunci, elastic abdominal tunic, external sheath of the rectus abdominis muscle, m. rectus abdominis, m. transversus abdominis and peritoneum. In the anterior two-thirds of the incision, the transverse abdominal muscle is composed of muscle fibres but in the posterior third it is entirely aponeurotic.

The medial-to-the-milk-vein incision is made parallel to the linea alba and between it and the milk vein. The length of the incision is 12 to 14 inches and the tissues incised are : skin, m. cutaneous trunci, external sheath of the rectus abdominis muscle, m. rectus abdominis, internal sheath of the rectus abdominis muscle and peritoneum.

If the incision is made midway between the mid-line and the milk vein, it will pass through the junction of the medial border of the rectus abdominis muscle and the lateral edge of the linea alba, it being noted that in the cow the latter structure is more of a band than a line.

The mid-line incision is made in the mid-line and extends 12 to 14 inches anteriorly from a point 2 inches in front of the mammary gland. The tissues incised are : skin, linea alba and peritoneum.

Using the left-sided lower abdominal approach, the rumen will lie over the sutured incision and should healing of the deeper layers be incomplete and rupture supervene, it is preferable to have the rumen, or part of that organ, occupying the hernial sac rather than small intestine which will occur if rupture takes place after an operation on the right side.

The utilisation of the mid-line site entails an incision through the linea alba so that only aponeurosis without any muscle fibres is available for suturing, hence one's sutures are placed in a relatively avascular tissue with the possibility of slower healing due to the poorer blood supply to the tissue in question. Where a quick-healing wound is desired it is felt that the safest policy is to incise where both muscle tissue and aponeurosis are present.

Among the advocates of the lower abdominal approach may be found the names of the following : Gotze (1928), Frank and Roberts (1940), Wright (1949), Rosenbaum (1940), Smith (1945), Ferguson (1939), Formston (1945), and Sutton (1947).

The Comparison between the Flank and Lower Abdominal Approaches

The conclusions reached from 42 operations—32 flank, 10 lower abdominal—are summarised below under the various headings. The comparison is made between the abdominal approach as a whole and the flank approach. If, however, any significant difference exists between the upper and lower flank methods, such difference is noted.

1. *Anaesthesia.*—General anaesthesia is preferable if not essential for the lower abdominal operation. For the lower flank operation, general anaesthesia is again preferred but infiltration anaesthesia may be used. Paravertebral anaesthesia is ideally suitable for the upper flank approach, but general or infiltration anaesthesia may also be used.

2. *Restraint.*—Lateral recumbency is suitable for the flank and lateral-to-the-milk-vein approaches, but dorsal recumbency is preferable for the other approaches.

3. *Elevation of the Uterus.*—This is accomplished most easily by utilising the mid-line or the lower flank, especially if the latter incision is made on the side corresponding to the gravid horn. The use of the upper flank normally implies greater difficulty in the raising of the uterus than is the case with the other approaches.

4. *Delivery of the Calf.*—If the calf is of normal or only slightly above average size, the optimum approach is the lower flank, followed by the lower abdominal and then the upper flank approach. The oversized, emphysematous foetus is, however, more easily delivered through the upper

flank than the lower abdominal site but the lower flank approach is again the one of choice.

5. *Elasticity of Muscles.*—This elasticity is greater the higher the approach is made. The nearer the mid-line the less the "give" of the abdominal incision when delivering a large foetus, due to the disposition of the rectus abdominis muscle and associated aponeuroses.

6. *Peritoneal Contamination.*—The chances of spillage of uterine fluids are greater in the upper flank approach than in the lower abdominal and lower flank sites when the animal is in lateral recumbency.

7. *Incidence of shock.*—Other factors apart, the degree of shock sustained is in direct proportion to the amount of handling (repulsion) of the intestines. The use of the upper flank approach usually entails a greater degree of repulsion of the bowel than obtains with the other approaches.

8. *Rupture of the Uterus.*—The repair of a ruptured uterus is more easily effected the higher the approach is made. Consequently, if this condition is diagnosed prior to operation, the upper flank incision is the one of choice.

9. *Muscle Relaxation and Closure of the Abdomen.*—Muscle relaxation is essential for efficient closure of the lower abdominal approach. Due to the greater elasticity of the tissues in the upper flank site, muscular relaxation is not so important. In the lower flank approach, at the distal end of the incision, this factor again assumes some importance.

10. *Tissues Available for Closure of the Incision.*—The higher the site the greater the "bulk" of tissue. In the upper flank the tissue is largely muscular. In the lower flank it is muscular proximally then aponeurotic and muscular distally, while in the lower abdominal approach the tissues become more aponeurotic as the mid-line is approached.

11. *Co-adaptation of the Wound Edges.*—This is easily accomplished in the flank approach but may become appreciably more difficult as far as the lower abdominal sites are concerned. Factors on which the ease of approximation depends are: (*a*) the degree of muscular relaxation effected by the anaesthesia, and (*b*) the amount and type of ingesta present in the rumen. If rumenal fermentation exists, trocarisation of the rumen may be necessary.

12. *Technique of Suturing.*—This must be of the highest standard when using the lower abdominal approach; one badly tied or badly placed suture may mar the outcome of the operation. Though it is not to be interpreted that slipshod technique is advocated for the flank approach, it will be appreciated that inferior suturing of the latter region is not so likely to be followed by such dire results as might obtain in the lower abdominal routes.

13. *Post-operative Infection of the Site.*—The approach which offers least opportunity for contamination of the wound is the upper flank site. The nearer to the mid-line the incision is made the greater the opportunity for wound contamination.

14. *Drainage of an Infected Site.*—Should infection gain access to the wound and the necessity for drainage arise, the nearer to the mid-line the incision is made the more efficient the drainage will be.

15. *Removal of Sutures.*—The higher the site of operation the earlier may the sutures be removed. As far as the lower abdominal approach is concerned, it is advisable to leave the sutures *in situ* until maximum healing has occurred.

16. *Post-operative Herniation.*—Theoretically, the lower the approach the greater the possibility of post-operative herniation, thus the "safest" approach is the upper flank while the "most dangerous" approach is the mid-line. The writer feels that if the surgical technique is good and post-operative infection of the wound can be prevented, the chances of herniation are remote. To date, the writer's experience substantiates this view.

OPERATION WITH THE PATIENT STANDING

The vagaries of the Animals (Anaesthetics) Act, 1919, have prevented the British veterinarian from utilising this method of operation, so it is to be hoped that at some not-too-distant date the Act will be amended and the veterinary surgeon permitted to decide which method of anaesthesia is best suited for the case under consideration. Then and only then will the surgeon be able to weigh the advantages and disadvantages of the standing and recumbent operations.

The side through which the obstetrician can palpate the gravid uterus in the lower flank region determines the side on which the operation will be carried out.

In the right flank approach, loops of intestine may prove a troublesome nuisance while endeavouring to raise the gravid uterus to the incision, while in the case of the left flank incision made just posterior to the estimated caudal end of the rumen, it is more unusual to encounter small intestine. Before attempting the left side approach in the standing position, the writer believed that the rumen would prove a formidable obstacle to the elevation of the uterus but this was found not to be the case. A careful pre-operative palpation of the left sublumbar fossa should indicate whether the rumen will prove a hindrance or not.

If the opening in the abdominal wall is made high in the flank, difficulty may be experienced in raising the uterus to the incision. The remedy is to make the original incision lower in the flank, when it will be found that access to and raising of the gravid horn is much facilitated.

The standing operation should not be attempted on the restless, nervous cow for should the animal go down or slip and fall down during the operation, the consequences may be grave.

Unfortunate results may follow if the cow coughs during the time when the peritoneal cavity is open, intestines being forced through the abdominal opening especially on the right side. The writer has not had the misfortune to attend such a case but he knows one veterinarian who abandoned this method because of a fatality resulting from prolapsing of intestines through the incision.

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Weekly Wisdom

It is only by studying the past that we can foresee, however dimly, or partially, the future. It may well be that it is only by respecting the past that we can be worthy of the future.—The Prime Minister, at Guildhall.

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In celebration of the 21st anniversary of Whipsnade Zoo this year, the 480-foot-long white lion carved in the chalk of Dunstable Downs will be illuminated with coloured lights every night from sunset to midnight.

THE NUTRITION OF THE DOG*

1.—Cases of vitamin deficiency arise in puppies or dogs in which the diet appears to be adequate as regards vitamin intake. Are there any other dietary factors which can prevent the absorption or utilisation of vitamins?

Dr. J. T. Abrams: Much of the work on vitamin requirements had been carried out with human beings or rats as experimental subjects. The vitamin B needs of the dog had received comparatively little attention: despite the information already available concerning the nutrition of the dog, it was still only about one-tenth of that needed.

The phrase "appears to be adequate" needed elaboration. There was, for example, a tendency in books and journals to regard specific intakes of certain nutrients as being "normal" for a given species, any deviation from such intakes being abnormal and wrong. In cases of this kind, the requirements for vitamin A might be set at some fixed arbitrary number of International Units of the vitamin per day. Such dogmatic statements, made without consideration of the particular criterion which had been used in assessing the adequacy of vitamin A intake, could conceal a good deal of ignorance.

The point could be illustrated by reference to work on the rat, where experimental evidence, as opposed to opinion without the support of critical tests, could be cited. If the criterion of adequate vitamin A intake were the simple maintenance of health in young or mature animals, then a certain average value could be adopted as meeting requirements. Where, however, the criterion to be employed was the ability of the animals to reproduce and raise their young to maturity, the previous levels of vitamin A intake would need to be multiplied by a figure of about three. If "health," good reproductive performance *and* long life were adopted as the criterion, then recent work suggested that a further threefold increase would be needed.

For dogs on a given intake of vitamin A it was thus possible that "normal health," but not reproduction and lactation, might be maintained. In such cases the vitamin A intake of the dog should always be carefully considered in relation to the status of the animal.

Another aspect of the problem which did not always receive sufficient attention was the variation which often occurred between the vitamin requirements of two animals of the same age, sex and condition. Experiments designed to show the magnitude of such variations might require a group of 30 or 40 animals and it was not difficult, therefore, to believe that such experiments had tended to be limited to small animals like the rat. Twofold variations of vitamin needs to produce a given response, *e.g.*, equal weight increases in a given time, were not out of the ordinary.

With regard to the question whether "other dietary factors" could interfere with the absorption of particular nutrients, the answer must be an affirmative one. The classical case relating to vitamins was, perhaps, the inhibition of the absorption of biotin by the protein of raw white of egg. The speaker believed that other cases of this kind did exist but that insufficient experimental work had been carried out with dogs, although, with regard to canine needs for vitamin D, there appeared to be no doubt that puppies of some of the bigger breeds were especially sensitive to calcium-phosphorus imbalance. To correct relatively small imbalances large amounts of vitamin D were necessary. In some species, also, the absorption and utilisation of vitamin A appeared to be related to the vitamin D content of the diet.

Professor A. N. Worden: There were one or two recognised examples in the dog of interference with the utilisation of vitamins. Anti-vitamins, or substances which interfered with the proper absorption or utilisation of vitamins, had been much studied in recent years. Among naturally-occurring ones were avidin, the fraction of egg-albumen which bound biotin and led to "raw egg-white injury," the enzyme present in certain fresh-water fish which destroyed vitamin B_1, the factor in bracken which also destroyed B_1, and the anti-nicotinic acid factor present in maize. Not only vitamins but also other metabolites could be affected in this way: it was possible that the toxic factor in agenised flour responsible for setting up attacks of hysteria acted by competing with methionine. In the laboratory it had proved possible to induce a variety of deficiencies by administering substances chemically analogous to vitamins and other essential metabolites. If present in sufficient amounts the analogue competed successfully with the vitamin or other metabolite and deprived the tissues of it. Some, but not all, naturally-occurring anti-vitamins appeared to act in this way.

Rancid fat was a not infrequent source of dietary trouble, and members would be aware of cod-liver oil injury, the destruction of vitamins A and E in poultry mashes, and so on. In 1932 D. Whipple (*Proc. Soc. exp. Biol., N.Y.*, **30**, 319) had described "A syndrome produced in the dog by inclusion of oxidised fat in the diet." A diet containing 25 per cent. lard had been oxidised by blowing hot air through it. The first symptom was marked loss of hair from all parts of the body, followed by rash formation and ulceration, loss of appetite, a period of constipation followed by diarrhoea and death. There were no ocular or oral lesions. Control dogs receiving good lard remained normal.

The precise nature of the harmful substance(s) in oxidised fat was unknown. There might be analogues of essential fatty acids. Vitamins A and E were certainly destroyed in the presence of oxidised fat and in some instances all vitamin A was destroyed within 24 hours of the addition of cod-liver oil to mashes. Some of the anti-oxidants were of considerable value in preventing the rapid development of rancidity.

Another type of dietary factor influencing the utilisation of a vitamin was the relative amount of associated metabolites in the diet. This was the case with vitamin B_1 and carbohydrate, utilisation of which depended upon available vitamin B_1. Experimental rats on a diet deficient in vitamin B_1 could survive for a considerable time if carbohydrate were so far as possible excluded from the diet. When sucrose was restored to the diet, however, the rats rapidly died with symptoms of vitamin B_1 deficiency.

Dr. J. T. Edwards lent support to the contention of Dr. Abrams that the question of vitamin requirements in the domesticated species of animals was far more complicated than it would appear to be from the results of experiments upon the species, notably rats, usually employed in the laboratory. It was becoming evident that not only were the requirements of the different species different, depending in part at any rate on the capacity of some species to elaborate their own vitamin needs—here again, often, from symbiotic action on the part of the microbial flora within the alimentary tract—but also that a variety of agents ingested by the individual animal might interfere so greatly with that particular kind of vitamin elaboration or with the utilisation of ingested vitamins by the animal organism, that actual symptoms of vitamin deficiency might arise even when there was no deficiency in the vitamin intake. He instanced, in particular, the revelations which had then (at the time of the meeting) just come to light in regard to the true nature of bracken poisoning in cattle, which had perplexed veterinary investigators since the commencement of the present century. There, it now seemed, what appeared to be a "poisoning" was caused not by an intoxication but by an enzyme in the growing bracken plant acting destructively on one of the vitamins of the B complex. Again, the researches of Mellanby and several others had shown most conclusively that an excessive cereal content of the dietary might likewise act destructively in ways that had now been well studied. The still more recent connection between cobalt deficiency and the anti-pernicious anaemia factor (vitamin K) would possibly be found to explain many forms of anaemia in our animals, and in particular "pine" in sheep, and the failure of the animal's defences to keep in check the intestinal worm-burden—which failure, thus, indirectly would induce symptoms of anaemia. The action of antagonistic substances was also now becoming more and more evident. An excess of sulphur, in organic combination in a diet (whether in the form of certain sulphonamides, such as were now being recommended in the routine treatment of caecal coccidiosis in chicks, or in the form of thiouracil or thiourea, such as were to be found in relatively high concentration in the *Brassicae*, such as kale), might therefore induce a state of hypothyroidism, which again indirectly would bear semblance to certain avitaminoses, such as α-tocopheral (vitamin E) deficiency.

* Central Veterinary Society "Forum," November 2nd, 1950.

The subject, indeed, was becoming so highly complicated that as Dr. Abrams had stressed in his timely warning to veterinary workers, assumptions made on mere clinical inspection of the existence of states of vitamin deficiency would often be found to be entirely erroneous: fortunately, the administration therapeutically of most of the vitamins was entirely innocuous.

Mr. S. Nye: He had had several cases of rickets and he would like to know if it was possible to overdose with cod-liver oil. Why were manufacturers allowed to say that their cake contained cod-liver oil if it was destroyed in the process? He knew that farmers would not feed cod-liver oil to pigs and calves because they said it was already in the cake.

Mr. W. B. Singleton: With the absorption and utilisation of vitamin A there must be a certain amount of vitamin E and if they fed a puppy on wholemeal bread, could they expect to obtain a sufficiency of vitamin E adequate for the absorption and utilisation of vitamin A?

Dr. Abrams: It was true that the feeding of young dogs and puppies was more complex than many people thought and Professor Worden had given additional examples of the destruction of dietary factors. The vitamin D in compound rations could be destroyed rapidly; cod-liver oil in the average type of ration might lose much of its vitamin A potency in a few hours. The destruction of vitamin A was likely under quite "normal" practical conditions and it was difficult to impress upon farmers and others the speed with which some of the necessary factors could be destroyed. Wholemeal bread and biscuits could indeed be a source of vitamin E but frankly he would not venture an opinion one way or the other concerning the point raised. The dog was a victim of civilisation; it was getting nothing like its diet under natural conditions. It was given odd bits of food, lean muscle cooked and recooked, so there was small wonder that the poor creature had a variety of diseases allied to faulty nutrition. It was to be hoped the position would be remedied in the course of time.

2.—Growing puppies of the larger breeds of dogs very often show rachitis symptoms even when given what appears to be an adequate diet. Can the forum suggest any supplement to the diet which might prevent this condition?

Mr. J. K. Bateman: His experience of the growing puppy was limited to greyhounds, but he had been responsible for the rearing of nearly 300 puppies annually for some 12 years.

One knew that there was much truth in the statement that growing puppies often showed rachitic symptoms even when apparently properly fed. Before the question of supplementary foods was considered one must examine the health of the puppies, the possibility of the presence of internal parasites, the housing conditions, the terrain on which they were being reared and the amount of exercise they obtained. Almost invariably one found that the rachitic condition was attributable to one or other of those factors and not to any food deficiency.

He often saw puppies in the early stages of rickets which could be put right by dealing with a round worm infestation. Again, it could be found in puppies which were housed in damp sunless kennels. Still more frequently rickets would be encountered in paddocks where the puppies spent much of their lives in rain-soaked runs. In both of these latter conditions it seemed highly probable that rheumatism set in because of the dampness, and the enforced laziness and unwillingness to walk about would soon send the puppies wrong in the legs.

The preventive treatment for all these conditions was obvious and remedial treatment would be successful if the condition was noted early and adequate steps were taken properly to drain kennel and run, ensure that there were provided dry beds on wooden platforms, and runs, of earth, liberally treated with ashes, clinkers, etc.

The really important factor in the rearing of big puppies, however, was not food, but exercise. Commonly puppies which naturally had large epiphyses and were provided with ample food, though they had large runs might not use them. Often they were too well fed, became lazy, and the sheer weight of their bodies would bend their limbs. It was a truism that one could not easily overfeed a puppy if he got sufficient exercise—but that sufficiency meant almost absolute freedom. A whole litter of puppies could go wrong in a very short time. He had known a week of very wet weather to ruin a number of beautiful puppies because the person in charge fed them too well and kept them indoors from the rain.

Rickets was more likely to occur in late-whelped puppies and there was more excuse for the appearance of the condition. Puppies which reached an age of six to eight weeks in the middle of winter were difficult to rear in the North of England or in Scotland.

The ideal was to have February puppies; these began to creep outside at the end of March and after that were able to withstand any rains as spring changed to summer and they did not then require to be protected from them.

Ideally, for their purposes, a single puppy, or at most, two reared on a farm with a collie did best of all, but this was not possible very often.

Pups of one litter being reared in a pen would not use it to their best advantage even if it was an acre or more in extent. They must be taken out into another field at least twice daily for progressive work, otherwise they would be found continually lying near the gate. They had discovered, however, that they could quite easily rear three or four litters free of rickets by so arranging adjacent paddocks that puppies raced up and down fences in competition with their neighbours, whilst at the distant end another litter ran about looking for the others to race up to them.

To sum up, his opinion was that given healthy pups, well fed and kept in good housing conditions, the reason for the appearance of rickets was more likely to be an overabundance of food and an insufficiency of exercise than the lack of anything in the diet.

Professor Worden: There was considerable evidence that a puppy of one of the larger long-legged breeds had a much higher requirement of vitamin D, relative to bodyweight, than puppies of the smaller breeds. Various workers had found that with a Ca/P ratio of the order of 2:1 the daily vitamin D requirement of Great Dane and other large puppies was of the order of 250 to 300 I.U. per kg. bodyweight. In similar circumstances the requirement of, *e.g.*, fox-terrier puppies was only about one-tenth of this value. With a Ca/P ratio nearer to unity even large puppies could be satisfied with a much lower order of vitamin D intake.

As had been pointed out recently, all the published studies relating to the vitamin D requirements of the dog had been conducted with calciferol or vitamin D_2. It was not established that the same breed differences existed with vitamin D_3, which was almost certainly utilised by the dog and which might well be investigated for larger breeds. He certainly agreed with Mr. Bateman that there were complicating environmental factors.

Mr. Williams asked whether it was possible that Mr. Bateman's difficulties with puppies arose from the fact that vitamin D in the diet was of less practical than theoretical significance and that the sunshine factor was of greater importance. That had often occurred to him, as he never understood why lack of exercise should have such a profound effect. One often saw puppies with rickets under conditions where exercise was given and puppies in which there was no suggestion of rickets, yet which received praetically no exercise.

Mr. E. W. Fawcus thought that exercise was essential. Many litters of puppies were born under quarantine conditions and despite the calcium phosphate—vitamin D in the ration at least 50 per cent. developed mild symptoms of rickets. Under such conditions there was neither adequate exercise nor adequate exposure to sunshine.

Dr. Abrams agreed with Mr. Williams: keeping the animals indoors restricted the beneficial effect of sunlight. In the North of England and Scotland where sunshine was not very powerful or abundant, the need for dietary vitamin D intake could not be eliminated even though the animals were exercised. Puppies of the larger breeds were sensitive to the dietary calcium-phosphorus ratio and it appeared from published work that one had to be careful with the ratio, otherwise the amounts of vitamin D required to correct the imbalance reached toxic levels.

Mr. O'Higgins: He would like to know the details of the normal diet and the ingredients.

Mr. Bateman: It was difficult to overfeed a puppy if it had ample exercise. He insisted on milk, raw meat or rabbit, bone meal and cod-liver oil, and brown bread. He had nothing against potatoes except that they made the greyhound bitch more like a pig.

Mr. O'Higgins said that was not a normal diet for a dog; the

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answer to all their problems of preventing rickets and vitamin deficiency would be found in attention to diet.

Mr. Bateman: He made a success of it, and the puppies were lovely.

Mr. O'Higgins: He had had experience with kennels and he found when he took over that there was quite a number with rickets and every second or third dog needed attention. Rickets ceased after he built a bakehouse and made biscuits, incorporating every known vitamin in the biscuit before and after cooking and feeding also raw meat, bones and raw greens. What was the difference between bread and potatoes from the scientific point of view? Was it the carbohydrates that the dog could not digest, and the amount of saliva in the mouth being insufficient to enable it to digest starch? Starch—and that included brown bread—should not be given to carnivorous animals; they could not digest it as they could not masticate it, because they had no lateral movement of the jaws and their molars were not adapted for grinding. He did not know where to find the "natural" animal as dogs had not lived in the natural state for a long time.

Mr. MacGregor: The natural food of the dog was raw meat; and its value was as a scavenger of rubbish—raw meat, cooked meat, rice and other cereals thrown out and possibly a rat or a rabbit hunted and killed. That was the natural dog and its natural food.

Dr. Edwards: Although a veterinarian who had qualified many years ago, like Mr. O'Higgins, might reasonably conclude, on the basis of the teachings of a few decades ago, that a dietary consisting of a large ingredient of bread or of potato was, in either case, essentially similar, yet now, with our better knowledge, we had come to realise that the differences were great. So far, of course, as the dog was concerned, the well-known fact that the potato contained such a concentration of vitamin C as to be adequate to meet human requirements did not seem to matter because the dog did not require an extraneous supply of this vitamin. Unpeeled potatoes again contained a fair concentration of the B vitamins. But, above all, what seemed to matter most was, as he (the speaker) had already mentioned, that the carbohydrates of the cereals and of the potato, in spite of both being composed mainly of fully formed starch, differed otherwise a good deal. There was in the cereals a fairly high content of pectins and other carbohydrates which were now proved to interfere with utilisation of other nutrients, and, it seemed, on the whole, the potato was much less likely to disturb the acid base balance of the body. In that respect, he (the speaker) said he would very much like to lend his support to what had just been so very well said by Mr. MacGregor. It was notorious that a dog's natural craving for what Mr. MacGregor called rubbish was very great. Indeed, the instinct of a dog to bury its bone, to return to it later, was just as deep as that of the tiger or panther to return to its "kill" after an interval.

Again, he would like to lend his support to Mr. Bateman in so far as his own experience in India had taught him that too early weaning of puppies and feeding of cow's milk (which was deficient in iron) led to the onset of anaemia; consequently, a very marked increase in the hookworm burden with an intensification again of the anaemia. Treatment of such puppies to cure the anaemia often was more satisfactory than specific anthelminthic treatment.

Mr. Hudson: Much harm was done by saying that the dog was carnivorous; it must have fresh fruit and vegetables as well as meat.

Mr. Bateman, summing up, said that rickets was more a matter of lack of exercise than of absence of sun: they must not shut in the growing animal. He had omitted to say that he fed raw vegetables all the time but found that carrots passed right through. There was a limit to the time they left the puppies suckling; sooner or later the bitch would set about them. He liked to put them on goat's milk first.

3.—Recent evidence suggests that canine hysteria is a disease of dietetic origin. Does the forum consider that there may be other factors associated with this condition?

Mr. E. W. Fawcus: He was far from being an expert on canine nutrition and it could be presumed that his views had been requested only because of his unique experience during the past five years in being responsible for the health of some 700 dogs of every size, age and breed undergoing quarantine.

He could not agree with the view that hysteria was purely of dietetic origin. In his opinion hysteria was due to the effects of gastro-intestinal irritation. This might be the reflex irritation associated with teething in the puppy; it might be the direct irritation of the stomach by foreign bodies, seen more especially in puppies which swallowed all manner of peculiar objects, or it might be that arising from the presence of a toxin in the food. However, in his own experience the majority of cases had been due not to the constituents or possible toxicity of the food, but the fact that it had been fed in a very wet and sloppy form. Here he would point out that the greyhound, which was so susceptible to this complaint, was usually fed in this manner. In these cases, including outbreaks in greyhound kennels, complete return to normality had followed the feeding of the same constituents in a dry or semi-dry state. Whether this wet form of feeding caused indigestion by over-extension of the stomach or whether digestion by gastric juices was interefered with because of over-dilution, he must leave to the physiologists. He would add to these causes the possession of a nervous temperament by the affected animal. It was rarely that one saw hysteria in the more placid retriever or springer spaniel but often in the excitable cocker spaniel and greyhound: no doubt the possessor of this type of temperament was predisposed to reflex irritation from the alimentary tract.

It seemed appropriate for him to comment upon the views, held by some, that dog-biscuit was the cause of hysteria. When he applied for his present post he was asked to give his views on the connection between biscuit feeding and hysteria—a question which caused him some embarrassment as at that time he believed meal to be a frequent cause. It might be that some inferior types of meal contained a toxin from faulty processing which would bring about the necessary irritation, but in all his time at those kennels, during which he had been responsible for probably some 8,000 dogs of all breeds, he had never had a case of hysteria apart from an occasional attack in a teething puppy. It must not be thought, however, that they fed biscuit meal only, as they gave approximately one-third cooked meat and a small proportion of green vegetable matter and carrot.

Although Mellanby's findings showed that a toxic substance might be formed from the agene treatment of wheat flour which, if fed, would cause hysteria, he personally did not think that this was in fact a frequent cause as, in practice, so little of this type of food was given to dogs. Certainly biscuit meal did not contain any.

It must be admitted that certain cases were seen which obviously were of dietetic origin and in which a change of food, whether from mainly meat to mainly biscuit or rusked bread, or vice-versa, would bring about a cessation of the attacks.

In other cases, however, in young animals, change and correction of diet had no effect, nor did any other treatment prevent periodic attacks until the age of six months was attained. His own conclusion, therefore, was that here it was the irritation caused by the eruption of permanent teeth which was the direct cause.

In yet other cases, either below the age of three months or over the age of six months, where the question of teething played no part and in which dietary corrections had no effect, examination of the stools showed the presence of round worms; here, eradication of these parasites brought about the cure of the patient.

It was his contention, therefore, based on practical experience, that diet was not the only factor involved in hysteria. He would go further and state that even in cases of so-called dietetic origin it was rather a mechanical type of irritation and not the actual constituents of the food which caused the symptoms.

Professor Worden was asked whether other besides "internal" factors were associated with the development of canine hysteria. He thought that the speaker had already indicated that there were. "Hysteria" included, of course, not only the condition under discussion but also those attacks associated with some apparently inborn factor (that led also to epileptiform convulsions) and those associated with certain virus infections. There was a great deal of misunderstanding of the work on the production of hysteria by dietary means. He believed that the discrepancy between the clinical symptoms shown by Mellanby's dogs and those noted in natural outbreaks was in large part a matter of dosage, and he understood that Dr. Mark L. Morris concurred with this view. The toxic factor in agenised flour had been isolated and was probably identical with

the factor isolated earlier from agenised zein. It appeared to be a derivative of methionine and might well act by competitive inhibition of this essential amino-acid.

Mr. Williams: He thought it pertinent to take this matter one stage farther back. There was no question that any breeder with experience could sort the puppies under his charge into two groups and say which of them was susceptible and which was not by the appearance of the animal. In his opinion there were, in the individual animal, conditions which were associated in practice with visible signs that certain puppies were susceptible to them.

Mr. Bateman: He believed hysteria was brought about originally by deficiency in feeding. In his opinion, greyhounds could be brought to an hysteria-prone state and it was not possible for anyone not previously in contact with the animal to know that a dog had reached it. He had seen hysteria occur in a group of dogs fed on doughy bread, just as he had seen the complaint in a group of dogs immediately after injection with a vaccine. In pre-war days in some nine years he had 150,000 runners and never had one case of hysteria. There must be some reason for this and he thought it was something in the way they fed dogs. A greyhound drank most of his food; he rarely gave his any dry food. He believed the state of hysteria-proneness was brought about by some toxin; the dogs appeared normal until some abnormal factor came in. He did not believe those dogs were all fed on agenised flour. He thought the experiments in the production of hysteria could be misleading. He imagined that dogs which developed hysteria after injection of vaccine did so because a strain had been put on the dog in the prone state.

Mr. L. Geffen recalled an hysteria case in which special feeding brought an improvement; while the animal was fed on raw meat, cold water and green vegetables and biscuit there was no question of hysteria, but five days after going back to its owner it threw a screaming fit with hysteria. He thought the dogs should have a sharp purgative, be starved 24 hours and then put on a special diet. He did not know whether there were other factors, such as virus infection, affecting hysteria, but one did know that there were hysterical owners. The hysterical owner caused most of the canine hysteria cases to-day, particularly with poodles.

Mr. Bateman: In one of his experiences he gave liquid yeast and raw vegetables and the dogs soon got back to normal. He had seen dogs with hysteria which he believed was caused by the doughy state of the bread. He had taken down a tin of pre-war biscuits and fed them on that and the hysteria had disappeared: the animals were back to normal in 24 hours and he had raced them. He never treated medicinally for hysteria. Special feeding and liquid feeding had a practical effect; he got good results and did not even have to give a sharp purgative.

Dr. Edwards: To his mind there could be no question but that a change-over to a mainly cereal, or bread, diet, at any rate, precipitated the onset of hysteria in dogs. That had been brought home to him as the result of observations during the last war, when such a change had to be made in the feeding. What the intimate cause of the production of symptoms was was still unresolved. He had followed the recent history of the subject from the beginning, in turn becoming impressed with the resemblance between the condition and Amundsen's Arctic pseudo-rabies, Mellanby's vitamin-A deficiency states, Mellanby's further reports on the artificial production of the disease by means of agenised flour, and the more recent work still, which emanated from America, suggesting that the initial disturbance was a liver intoxication, such as could be set up artificially by several drugs (carbon tetrachloride, benzedrine, etc.). However, there seemed to be a great deal in what Mr. Bateman and other speakers had said suggesting that dogs endowed with a certain "temperament" were particularly prone to the disease. There, again, "temperament" was a loose handy term, which, in the induction of hysteria states, needed to be related more closely to a defined physiological state, such as, for example, the autonomic nervous system.

Mr. W. A. Pool: Dr. Mitchell, of the Canadian Department of Agriculture, had said that Arctic dog disease was rabies. It was sometimes two years before he got specimens at the laboratory, and because of the long delay the critics had suggested otherwise, but there was no doubt it was rabies.

Dr. Edwards: On getting outbreaks Amundsen and others cured the huskies immediately if they fed them on blubber. In the seal and the walrus the vitamin-A storage was in the subcutaneous fat, not in the liver fat. Woodrow had some experiences of that kind. The early literature had been well reviewed in an article published several years ago in the *Veterinary Journal* (1933) and it was hard to get round the fact that these outbreaks were actually cured by giving the huskies blubber.

Professor J. McCunn: It was obvious that hysteria was of dietary origin. Before 1914, except for odd cases, hysteria was prevalent only in keepers' dogs and in hunting kennels. They got it because of their methods of feeding. Most dogs had their bulk feed from wheat offals. Pre-1914 the dogs were rich in essential vitamin B and people were deficient; then with the war standard bread came in and the reverse happened—people got more vitamin B, the offals diminished, and dogs had less of the offals which formed their bulk food. Until white bread came in again the hysteria outbreaks in individual dogs were formidable. Again, in the last war, hysteria had been somewhat prevalent as the extraction rate was low and people had eaten more of the essential factors. It would now swing the other way.

4.—Are there any essential fatty acids necessary for the dog? In which natural form are they most readily available?

Professor Worden stated that fat had two functions, the supply of energy and the provision of essential fatty acids, some of which appeared to be essential for normal health and the maintenance of a normal skin. There was little exact work apart from that of Hausen and his colleagues at Minnesota (*Proc. Soc. exp. Biol, N.Y.* (1943.) **52.** 205-208), whose work had already been discussed before the Society at the meeting in 1944 addressed by Joshua, Isgard and Worden (*Vet. Rec.* (1945.) **57.** 151-156 and 168-170). At this same meeting attention had been drawn to the probable existence of fat deficiency in dogs in Great Britain. Dr. Morris also had remarked upon the high incidence of fat deficiency in dogs in this country. Troubles due to the feeding of rancid fat might well be an indirect form of essential fatty acid deficiency, for reasons already given. He believed that the manufacturers of present-day foods were alive to the fat problem, were providing sufficient fat of the right type in their products, and were doing their best to prevent oxidative change. As to the natural forms most readily available, linseed oil was the best-known source and was employed by clinicians in small doses. It could be used without harm in appropriate quantities, but on the basis of experimental work he did not advocate its daily administration nor its regular admixture with the diet. There was a relationship between at least one member of the vitamin B complex (vitamin B_x) and essential fatty acids and the provision of a sufficient amount of this would help to overcome the effects of essential fatty acid deficiency. Far too little attention was paid to liver as a foodstuff for dogs.

Professor McCunn asked if the linseed oil was given raw and Professor Worden said that as little as 1 c.c. would provide the dose required.

In reply to Mr. Bateman, who remarked that they could not get the liver, Professor Worden said some of the dog food manufacturers were incorporating 6 to 10 per cent. on a wet-weight basis.

Mr. Fawcus, expressing ignorance of the fat deficiency diet, asked how a diagnosis was arrived at and how one would know when to give linseed oil.

Miss Freak: She had been using linseed oil in practice. The condition that she associated with fat deficiency was poor coat, the almost complete absence of undercoat and slight condition of scurviness. One found that linseed oil affected a practical cure over three or four weeks. She used boiled oil but she did not know whether she was wrong and if the dog would be better on raw oil. Rabbit was the only source of meat for these dogs; the alternative was horse-flesh, which was usually lean, therefore the natural source of animal fat was very limited.

Professor Worden: There was the important factor for all species of fat tolerance, there being the instance of Shorthorn milk being fed to Jersey and Guernsey calves because the latter could not tolerate milk from their own breeds. McCay, in his book, did not make it too clear whether the dog was short of fat in bulk or of the things contained in the fat. On the basis of evidence to date they ought to provide traces of essential fatty acids in foods, but an excess of fat was harmful to the dog. They could impede the passage by increasing the fat content in the diet.

Professor McCunn: Fat in the stomach was there for an average of six hours.

Professor Worden: This was an important clinical factor. It was apparent from Miss Freak's remarks that dogs did respond to linseed oil, but raw oil was safer than that treated by boiling. Herring was certainly a source of essential fatty acids, and a source also of many other nutrients required by the dog.

Professor McCunn wondered whether the chronic skin lesions due to putrefactive changes in the fat arose from a shortage of some essential fatty acids.

Professor Worden: He thought most cases were probably a consequence of that, but he would point out that the feeding of oxidised fat brought about not dissimilar changes and competed with the right things and made them unavailable.

5.—Skin diseases seen in dogs are often said to be associated with a faulty diet. Does the forum consider that this association is correct? If it is, what alterations might be made in the diet to prevent these conditions?

Mr. R. E. Williams: It must be assumed that the question referred to the so-called "non-specific" skin conditions.

Some evidence had been presented to show that the initial lesion in these cases might be in the form of an allergic reaction and Schnel'e in the U.S.A. had reported sensitisation tests which incriminated particular'y the proteins of cereal foods, pulses and fish. But this seemed to him to lead the clinician into deep waters at once. That such causes might operate was quite evident from the magical response in selected cases to treatment with antihistaminics, but in practice he found this obliging group to be only a small percentage of the total, so that, in the absence of alternative explanations, he thought one might say only that a small group of skin diseases might be specific reactions to foodstuffs. One must never forget, however, that allergic responses were essentially a characteristic of the individual and not a malign property of the sensitising agent.

In his opinion, a much more common dietetic fault was gross over-feeding, leading to obesity, idleness and constipation—a triumvirate which traditionally had been associated with "overheated" blood and hence pruritus. While this descriptive conception might have no scientific meaning, the clinical syndrome was there for all to observe. Whether this condition was due entirely to domestic indulgence, or what part some degree of hypothyroidism played in its causation, was not always clear. It might be considered that while obesity might be exaggerated by over-eating, it had a physiological basis, and the appreciation of the patient as a constitutional unit rather than as an unfortunate with a skin disease attached, might be rewarding.

Two dietetic errors frequently met in practice which undoubtedly gave rise to skin disease were a deficiency of fats and excessive salt. The dog biscuit and water enthusiast would produce the first and the grocer, with his bacon, bones and trimmings, the second. The remedy was evident. With the exception of certain rarer hypertrophic conditions and the hypothyroid and gonad alopecias, the clinically troublesome cases could be summed up in one word—*pruritus*. To him, this, plus subsequent trauma and perhaps infection, represented the "bag of tricks." Many things could be blamed for pruritus—*e.g.*, external and internal parasites, allergy, plethora, focal sepsis, *chronic nephritis*, etc., only two of which could be connected with diet. It was obvious that a majority of dogs tolerated these conditions without developing skin lesions and that at least two breeds of dogs, the Scottie and the Sealyham, were infinitely more prone to recurrent trouble than others, some of which were almost immune. Therefore one must visualise the essential condition as a constitutional tendency, possibly inherited: diet could only take its humble place among the list of trigger mechanisms.

Mr. Fawcus agreed with Mr. Williams, but said that one condition he had not mentioned was the skin condition associated with vitamin A deficiency. He could recall one remarkable case of a Manchester terrier with extensive alopecia due to vitamin A deficiency. The giving of cod-liver oil for several weeks effected no improvement so he injected vitamin A intramuscularly; after the first injection there was an improvement and after three or four injections the hair returned: it was in good condition.

Dr. Edwards: Mr. Williams' point about the trigger mechanism was absolutely true. In his recent experience in Egypt the most common diseases among domesticated dogs were skin diseases, particularly among the dogs of wealthy owners, and the assumption was that many of the dogs were exposed to the hot weather or to the bathing in sea water at seaside resorts. This combination of sea water and dry sunlight brought about these terrible conditions of eczema, but the ordinary dog which foraged for its food never suffered. Mr. Williams had rightly said that individuality came into play; there was an hereditary factor.

Mr. Williams: Altogether insufficient consideration was given to the genetic concentration which had occurred in dogs in this country. No other animal was in-bred to the same degree and inherent tendency was going to be concentrated and assume very great importance. He was continually impressed by the variation of individual animals; the same treatment and diet in one resulted in a normal life, whereas another individual succumbed to conditions of hysteria or skin diseases. There must be some other factor, not genetical, at work, and it must be an intrinsic factor.

CLINICAL COMMUNICATION

SUCCESSFUL TREATMENT OF BLACKLEG WITH PENICILLIN

J. B. CONLON, M.R.C.V.S.,
Monaghan, Eire

Subject.—Four months old pure-bred Jersey heifer calf.

Symptoms.—When seen this calf, which had been ill for 24 hours, was "down" and unwilling to rise. Temperature was 106°. There was a well-marked grunt and "grind" and other evidence of pain. A large crepitant area, typical of blackleg, was found in the hip region. This area was extensive and involved the greater part of the musculature of this region. A similar swelling was apparent in the intermaxillary space. This latter lesion was interfering with the calf's breathing, which was stertorous and difficult.

Diagnosis.—Advanced blackleg.

Prognosis.—Bad.

Treatment.—One ampoule of penicillin G. Distaquaine fortified (900,000 units crystalline Procaine salt and 300,000 units of potassium salt) was injected in different locations in the leg lesion, and 1,000,000 units crystalline penicillin into the lesion in the jaw. Later that night a further 500,000 units were injected by the owner into the muscles of the hip. When seen the next morning this calf was on its feet, and anxious for its drink. Temperature was 102·5°, general appearance good: bright and anxious to feed. On account of the lesion in the jaw it was unable to drink from a bucket, but could swallow milk when placed in its mouth from a bottle, and was fed in this way. For four days penicillin was injected by the owner into each lesion, the total amount daily being 500,000 to 700,000 units. With the object of trying to prevent necrosis the leg lesion was bathed with hot water. After about seven days this calf was normal except for some slight lameness which persisted for a few weeks. No sloughing of tissue occurred. The result obtained in this case was remarkable, and would lead one to expect similar results with larger animals if penicillin was available to the profession at a more economical price.

ABSTRACTS

Starch Sponge—A New Haemostatic Agent*

The author describes an absorbable starch sponge which may be used both as a food and a surgical dressing. It is capable of absorbing 16 times its weight in water. It can absorb appreciable amounts of penicillin, streptomycin, gramicidin and sulphonamides. It disintegrates slowly in body fluids and the dissolved material after enzymatic attack is absorbed by the tissues without harmful results.

Employed as a haemostatic agent in 155 cases the starch was applied as a bar, a gauze-impregnated pack, or as powder, into the peritoneal cavity, uterus, vagina, perineum, rectum, fascia, and muscular tissue. Results are stated to have been very satisfactory. The low cost of this preparation makes its use in veterinary practice worthy of further investigation.

J. P.

* **Starch Sponge—A New Haemostatic Agent.** *J. Amer. vet med. Ass.* Oct., 1951. **119.** 283 (quoting Rosenfeld, S. S. *Amer. J. Obst. Gynaecol.* May, 1951).

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The Use of Climatological Data for Assessing the Regional Incidence of Anthrax in India*

In many parts of India conditions are highly favourable for the persistence of anthrax, owing to the hot climate and moisture sufficient for sporulation. Added to this is the general lack of any proper system of carcase disposal. In order to define the position more clearly, so that organised schemes of vaccination may be put in hand, maps (scale 1 inch to 400 miles) were drawn, one for each month of the year, of the areas in India and Pakistan which, on climatic grounds, are more or less favourable for sporulation. For this purpose use has been made of the mean monthly records for air temperature and humidity, as portrayed in Eliot's *Climatological Atlas of India*. On the basis of these records and of certain laboratory experience, arbitrary divisions have been set up. Thus, areas where the relative humidity (4 p.m. reading) is below 60 per cent. or where the temperature is below 70° F. are classed as unfavourable; over this level of humidity, as air temperatures increase from 70° F. to above 90° F., conditions are classed as increasingly favourable. Four arbitrary divisions are created in this way and the areas which correspond to them are indicated on the maps by different types of stippling.

Within certain limitations, which are discussed chiefly in relation to air temperature and rainfall, the areas defined as favourable should coincide with regions likely to be especially dangerous from the point of view of anthrax. The maps are used for compiling a statement showing geographically for each month the areas falling within the above-mentioned arbitrary divisions. Tracings of similar scale giving major political divisions and broad orographical particulars are also included; by fitting these on to the maps, the relation of the stippled areas to geographical regions and orographical formations can be seen. For more accurate use in practice, copies of the maps should be enlarged to a suitable scale, say, 1 inch to 64 miles, and reproduced on printed maps that are available in this size and that show the necessary political and orographical detail.

* **The Use of Climatological Data for Assessing the Regional Incidence of Anthrax in India.** Minett, F. C. (1951.) *Bull. de l'Office internat. des Epizooties.* **35.** Nos. 6-7. 226.

QUESTIONS IN PARLIAMENT

Foot-and-Mouth Disease

Mr. Noel-Baker (April 7th) asked the Secretary of State for Foreign Affairs what special funds have been made available to the United Nations Food and Agriculture Organisation to enable them to organise joint international action against foot-and-mouth disease.

Mr. Eden: None, Sir. Her Majesty's Government contribute the equivalent of about 750,000 dollars annually to the Food and Agriculture Organisation, whose programme includes work on the control of foot-and-mouth disease.

Her Majesty's Government also provide the funds for the Foot-and-Mouth Disease Research Institute at Pirbright, which carries out systematic epizootiological surveys on foot-and-mouth disease, both in conjunction with F.A.O. and also on occasion by direct co-operation with the countries concerned.

Mr. Janner (April 10th) asked the Minister of Agriculture if he will give an assurance that every effort is being made in this country by way of research to combat foot-and-mouth disease; and if he will ensure that his research establishments investigate methods successfully used in other countries.

Sir T. Dugdale: Yes. Our research station at Pirbright is devoted to the study of this disease and is to be extended. Full account is taken of the experience of other countries.

Mr. Hurd asked the Minister of Agriculture what evidence he has derived from the recent outbreaks of foot-and-mouth disease in this country to show that livestock on farms where organic manuring is practised exclusively are immune to infection; and if he will make a statement.

Sir T. Dugdale: I have found no evidence to suggest that organic manuring on a farm tends to make the livestock there immune to foot-and-mouth infection; but my Department does not collect information about manuring practices on farms where the disease has broken out.

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Inspection of Animals Used for Experimental Purposes

Mr. Philips Price (April 10th) asked the Secretary of State for the Home Department to what extent he is making new arrangements with regard to the appointment and activities of inspectors under the Cruelty to Animals Act, 1876; what steps he proposes to take with regard to the recommendations of the Departmental Committee appointed to advise on the future organisation of medical staffs employed in Government Departments; and if he will consult with organisations representing the veterinary profession, with a view to introducing amendments to the 1876 Act so as to provide for the participation of veterinary surgeons to carry out the work of inspecting animals used for experimental purposes.

Sir D. Maxwell Fyfe: The Report of the Committee on the Pay and Organisation of Civil Service Medical Staffs is still under consideration by the Government, but I am very willing to arrange discussions with the veterinary profession about the Cruelty to Animals Act, 1876, and I have in fact already invited the British Veterinary Association to discuss their problems with officials of my Department.

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Livestock Collecting Depots

Sir W. Darling (April 7th) asked the Secretary of State for Scotland if he is aware of dissatisfaction in the present arrangements for livestock transport in the country districts; and if he will take immediate steps to discourage further curtailments of this service.

Mr. J. Stuart: I am not aware of this dissatisfaction, but if my hon. Friend will give me more precise details and the districts concerned, I shall be glad to look into the matter with the other interested Departments.

Sir W. Darling asked the Minister of Food how many livestock collecting depots have been closed or transferred in the last 12 months in Scotland.

Major Lloyd George: A new centre has been opened at Jamestown to replace one closed at Dumbarton because of the sale of the premises for other uses. There have been no other changes.

XUM

NOTES AND NEWS

Diary of Events

April 23rd.—First Annual General Meeting of the Society for the Study of Animal Behaviour, at the Wellcome Research Institute, 183-193, Euston Road, London, N.W.1, 2.30 p.m.

April 25th.—Meeting of the Mid-West Division, B.V.A., at Clifton, Bristol (Berkeley Café), 2.15 p.m.

April 25th.—Meeting of the Midland Counties Division, B.V.A., at Leamington Spa (Regent Hotel), 2.30 p.m.

April 26th.—Annual General Meeting of the Association of State Veterinary Officers, at the Royal Veterinary College, Camden Town, N.W.1, 2 p.m.; Annual Dinner, Criterion Restaurant, Piccadilly, W.1, 6.30 p.m.

June 4th.—109th Annual General Meeting of the Royal College of Veterinary Surgeons, at 10, Red Lion Square, London, W.C.1, 12 noon.

June 4th.—Annual General Meeting of the Victoria Veterinary Benevolent Fund, at 10, Red Lion Square, London, W.C.1,—immediately following the above.

June 4th to 6th.—Meetings of Committees and Council, R.C.V.S., at 10, Red Lion Square, London, W.C.1.

June 12th.—Annual Meeting of the R.A.V.C. Golfing Society, at the North Hants G.C., Fleet.

Sept. 8th—13th.—Seventieth Annual General Meeting and Congress of the British Veterinary Association, at Harrogate.

B.V.A. Quarterly Meetings in Edinburgh

The following are the arrangements for the quarterly meetings of the British Veterinary Association to be held in the Royal (Dick) School of Veterinary Studies, Edinburgh, on April 29th and 30th, and May 1st:—

Tuesday, April 29th:
12 noon. Home Appointments Committee.
2.15 p.m. Veterinary State Medicine Committee.

Wednesday, April 30th:
10.30 a.m. Organising Committee.
12 noon. Parliamentary and Public Relations Committee.
2 p.m. General Purposes and Finance Committee.

Thursday, May 1st:
10 a.m. Council.

R.C.V.S. Examinations

May 7th.—R.C.V.S. Animal Management Examination. Tour commences at Edinburgh.

May 8th.—Entries for D.V.S.M. Examination due.

May 12th.—R.C.V.S. Pharmacology, etc. Examination (Revised Syllabus): Written Examination.

June 5th/6th.—D.V.S.M. Written Examinations at Edinburgh.

June 26th/27th.—R.C.V.S. Membership Written Examinations.

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Castration and Docking

As has been intimated in recent issues, the Technical Development Committee has been discussing the subjects of castration and/or docking of lambs and the castration of calves, and is now anxious to obtain views from members of the profession on various procedures.

Details are required, particularly, concerning the use of rubber ligatures for these purposes, and also for the docking of puppies. The Committee would be grateful if members interested would send in to the General Secretary a note of their experiences of methods of application and materials used, of their opinions in respect of the pain factor, and of the period taken to obtain the final result. It would also be useful if observations upon the sequelae, favourable or otherwise, could be included.

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Guide to Veterinary Surgeons Officiating at Small-animal Shows

Further intimation is now given that the above publication of the Association (No. 13) has been revised by the inclusion of additional extracts from Kennel Club show regulations, and in certain other respects. Any member of the B.V.A. can obtain a copy of the revised Guide on application to the General Secretary at 36, Gordon Square, London, W.C.1.

PERSONAL

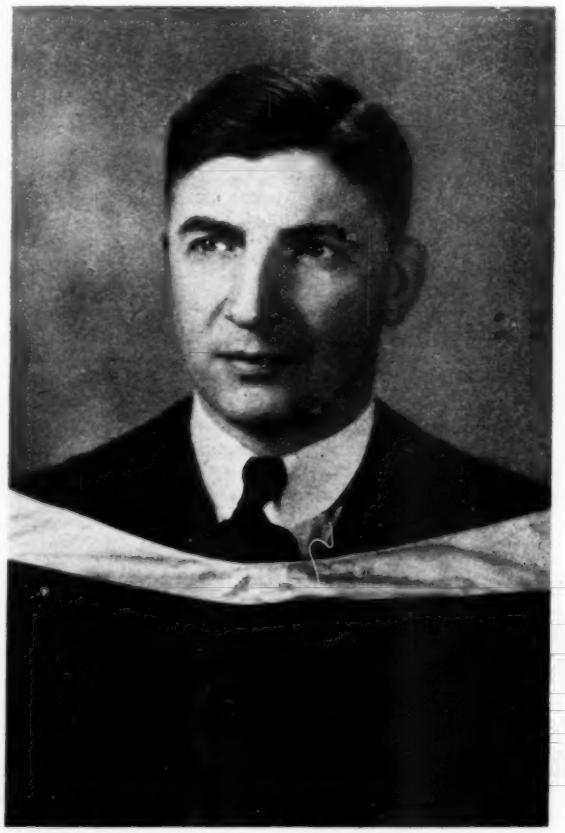
Dr. Trevor Lloyd Jones Appointed Principal of Ontario Veterinary College

Ontario's Minister of Agriculture, Colonel T. L. Kennedy, has announced the appointment of Dr. Trevor Lloyd Jones to succeed the late Dr. A. L. McNabb as Principal of the Ontario Veterinary College. Dr. Jones has been Acting Principal since Dr. McNabb became ill in August, 1950.

Born in Mold, North Wales, in 1909, Dr. Jones farmed in his native country until he went to Canada in 1929. After 18 months of ranching in British Columbia he entered the Ontario Veterinary College at Guelph, graduating from that institution in 1934. During the ensuing year he worked as a graduate assistant with the Ontario Research Foundation in Toronto. In 1935 he took graduate work at the Institute of Parasitology, Macdonald College, Quebec, obtaining a Master of Science degree from McGill University.

From 1935 until 1939 Dr. Jones was an assistant in the Department of Pathology and Bacteriology at the Ontario Veterinary College. He was then named Provincial Animal Pathologist, Alberta Department of Agriculture, with headquarters in Edmonton, and continued in this position until 1943.

Dr. Jones served in the Canadian Army in 1943 and 1944 with the rank of Captain. During this period he was engaged in a secret project under the Directorate of Chemical Warfare and Smoke.



After resuming his former position in Alberta as Provincial Animal Pathologist for a year, Dr. Jones returned to the Ontario Veterinary College. He was a Professor of Pathology at the College until the summer of 1950, when he was appointed Acting Principal.

Dr. Jones was married in 1934 to Gertrude Sorby, daughter of the late Oswald Sorby, who was prominently identified with the breeding of Clydesdale and Hackney horses at "Woodlands," Guelph, some years ago.

The new Principal is active in veterinary and livestock organisations in Canada and in the United States. He is First Vice-President of the Ontario Veterinary Association; and a member of the Research Council and Resident Secretary of the American Veterinary Medical Association. He is also a member of the Canadian Veterinary Medical Association Council, the United States Livestock Sanitary Association and the American Society of Animal Production.

Dr. Jones was President of the Guelph Little Theatre in 1950-51 and has taken part in several plays presented by that organisation. He is a member of St. George's Anglican Church, the Guelph Rotary Club and the Guelph Committee of the Canadian Save the Children Fund.

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Birth.—Hyam.—On April 3rd, 1952, at Gravesend, to Heluir Melanie, wife of R. I. C. Hyam, M.R.C.V.S.—a son, Richard John Churchill.

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Forthcoming Marriage.—Stockman—Stockwell.—The engagement is announced between Captain Michael J. R. Stockman, R.A.V.C., now serving in Malaya, son of Mr. H. W. Stockman, C.B.E., and Mrs. Stockman, of Ealing, and Valerie Stockwell, B.Sc., M.R.C.V.S., younger daughter of Mr. and Mrs. A. J. Stockwell, of Radlett.

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Marriages.—Hoare—Massie.—On January 10th, 1952, Alec Tredaway Hoare, of Nyere, Kenya, to Miss Margaret N. Massie, M.R.C.V.S., of the Veterinary Department, Mpwapwa, Tanganyika.

Pyke—Monk.—On March 29th, 1952, at Holy Trinity Church, Sutton Coldfield, Brian Pyke, only son of Mr. and Mrs. F. N. Pyke, of Guildford, to Marie Monk, B.V.Sc., M.R.C.V.S., only daughter of Mr. and Mrs. F. Monk, of Tudor Hill, Sutton Coldfield.

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YORKSHIRE DIVISION DINNER-DANCE

A most successful Dinner and Dance was held by the Yorkshire Veterinary Medical Society at the Parkway Hotel, Leeds, on Friday, March 28th, 1952. The speakers were Professor J. G. Wright, President of the Royal College of Veterinary Surgeons; Mr. A. J. Wright, President of the British Veterinary Association; Mr. D. H. Findlay, Provincial Director, Yorkshire and Lancashire Province of the National Agricultural Advisory Service; and Mr. J. O. Powley, of Harrogate. The President of the Society, Mr. H. B. Allan, welcomed the guests, who included Professor J. McGregor, Leeds University; Dr. W. A. Hyslop, President of the Leeds Branch of the B.M.A.; Mr. R. C. Joy, Agricultural Correspondent of the *Yorkshire Post*, and their ladies.

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LONDON VAN HORSE PARADE

Given the perfect weather that, in fact, prevailed, it was a foregone conclusion that one of London's chief attractions for the Easter Monday holiday would be the show staged by the London Van Horse Parade Society in Regent's Park. It was particularly gratifying to the promoters that not only was the number of entries for the parade two more than last year, but that it was possible this year to give to every competitor the first-class award of a red rosette and the small money prize that goes with it, thus showing that once again the event had achieved its object—the improvement of the general condition and treatment of van and light draught horses and ponies used for business purposes, and the encouragement of drivers to take a humane and individual interest in the horses under their care.

Except for seven pairhorsed vehicles and three drawn by four-horse teams, the entries were all single-horsed vans, and the total number of horses was 310. Dairymen continue to provide the largest number of entries, though their total of 97 was in all but two cases made up by large milk-producing companies rather than individual dairymen. This applies also to the bakers with 36 entries and the group of laundries with 12 entries. Greengrocers, with 35 entries, were mostly small traders, and one of them, combining greengrocery with shellfish, was Mr. Bert Matthews, the "pearly king" of Hampstead, who recently visited the United States with his wife, the "pearly queen" of the borough.

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THE HEAVY HORSE

In its spring number the *Horse and Pony News* reports that the British Horse Society's Heavy Horse Committee has met representatives of the Ministry of Agriculture and the Department of Agriculture for Scotland for general discussion.

The Committee had decided to prepare a booklet showing the use of heavy horses in various aspects of agricultural and transport work. They had also approved of the coloured film of the four horsed heavy horse teams taken at the last Royal Show, and of the black and white film taken at the Cart Horse Parade in London. The Secretary was instructed to have these films edited and titled, and then to add them to the Society's Lending Library.

Heavy Horse Stallion Grants.—Mr. Locke, of the Ministry of Agriculture, had brought up for discussion a suggestion that in districts where there were no heavy horse stallion societies, official grants might be made to private stallion owners. The Committee had discussed this proposal fully, and the Ministry would now consider the suggestions made and discuss them, with other ideas submitted, with the Department of Agriculture for Scotland.

Investigation into the Economic Position of the Heavy Horse.—A report had been received from Mr. K. Dexeter, of the School of Agriculture, Nottingham, on the progress he was making in the investigation into the economic position of the heavy horse. This investigation was being made on very broad lines covering the influence of factors responsible for the decline of the horse on the farm, analysis of jobs that horses can do best on the farm to-day, and a series of budget studies to find out the conditions under which it is profitable for farmers to keep horses, or to keep a combination of tractors and horses.

It was not possible at the moment to draw any conclusions from this investigation, but the Committee noted the report, and the Secretaries of the Heavy Horse Societies expressed the hope that they might shortly be having some useful official information as to the value of the horse on the farm which could be used by them.

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ADDRESSES OF DISEASE-INFECTED PREMISES

The list given below indicates, first, the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax:

Cornwall.—Tappard Farm, Gwinear, Hayle (April 5th).

Cheshire.—Baddington Bank Farm, Baddington, Nr. Nantwich (April 7th).

Foot-and-Mouth Disease:

Essex.—Moor Fields, Blue Gate Farm, Great Bromley (April 7th).

Fowl Pest:

Cambs (*Isle of Ely*).—37, The Avenue, March (April 5th).

Hunts.—Fullard's Farm, Woodhurst, Huntingdon (April 7th).

Notts.—Fiskerton Mill, Fiskerton, Newark (April 7th).

Warwicks.—24, Roberts Road, Handsworth, Birmingham (April 4th); Upper Farm, Gardon, Warwick (April 5th); 8, St. Nicholas Avenue, Kenilworth (April 7th).

Worcs.—Fringe Green, Aston Fields, Bromsgrove (April 4th).

Swine Fever:

Beds.—174, High Street, Arlesey (April 8th).

Essex.—Hillcrest, Chapel Hill, Halstead (April 5th).

Herts.—Chesterfield, May's Lane, Barnet (April 9th).

Isle of Ely.—Woodland House, 74, London Road, Chatteris (April 9th).

Lancs.—35a, off Leicester Street, St. Helens; Frith Farm, Gregson Lane, Hoghton; Elms Farm, Whitefield (April 5th); Wood Farm, Back Lane, Appley Bridge, Shevington (April 7th).

Leics.—Lindridge Hall Farm, Desford (April 5th); Whatton Fields Farm, Long Whatton, Loughborough (April 8th).

Northants.—Stonehouse Farm, Long Buckby (April 8th).

Notts.—96, Main Street, Huthwaite (April 5th).

Surrey.—Guildford Park Farm, Ridgemount, Guildford (April 5th); Corporation Nurseries, Durnsford Road, Wimbledon (April 7th).

Sussex (*E.*).—Benfield, Firle Road, Peacehaven (April 8th); Cleaver's Farm, Laughton, Lewes (April 9th).

Warwicks.—189, Blackhorse Road, Longford, Coventry; Birchley Hall Farm, and The Store, Common Lane, Corley Moor, Fillongley, Coventry; Yew Tree Farm, Nether Whitacre, Coleshill, Birmingham (April 7th).

Yorks (*E.R.*).—Experimental Farm, High Mowthorpe, Duggleby (April 5th).

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REINDEER EXPERIMENT IN SCOTLAND

The Reindeer Council of the United Kingdom has received the approval of the Scottish Department of Agriculture for the use of 300 acres offered by Lieut.-Colonel J. P. Grant Younger, of Rothiemurchus, Inverness-shire, for the first phase of an experiment with reindeer in Scotland. Work on the fence round the Rothiemurchus Forest reindeer reserve began in January. Mr. Mikel Utsi, technical adviser to the Council, has sent a first consignment of eight reindeer from Narvik in the s.s. *Sarek*. The Royal Zoological Society of Scotland has offered quarantine accommodation in its park at Edinburgh, where the animals will remain 28 days. The Reindeer Company, Limited, registered at Edinburgh, will carry out the experiment.—*The Times*.

FOOT-AND-MOUTH DISEASE

Since the intimation given in our last issue of new outbreaks of foot-and-mouth disease among cattle and pigs at Stock, Essex, and among cattle and pigs at Checkley, near Crewe, Cheshire, further cases have been confirmed at Great Bromley, Essex, at Nantwich, Cheshire, and at Wrinehill, Staffs.

The Canadian Federal Department of Agriculture has announced that permits for importation of cattle and swine from Scotland and England will not be issued until further notice. This step is part of the barricade to keep foot-and-mouth disease out of Canada. There have been no new cases reported in Canada since March 8th, and by March 13th all infected animals and contacts had been destroyed.

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DAMAGE TO HIDES BY WARBLE AND HORNING

Speaking at a recent luncheon in London, Mr. G. W. Odey, M.P., Chairman of the United Tanners' Federation, said that the tanning industry could supply demands for unblemished leather to make goods for export only if it could get greater supplies of better hides. Many of the domestic products, which in texture were among the best in the world, were injured before they reached the tanneries. Mr. Odey invited the help of the Ministries of Agriculture and Food in efforts to reduce damage. He pointed out that after changes in markets during the past year, hides damaged by the activities of the warble fly were now selling at a discount, which if continued for 12 months would mean a loss of more than £1,000,000 to the Ministry of Food. Greater use by farmers of electric fencing would mean fewer defects in hides through barbed wire scratches, and if more cattle were dehorned there would be less damage through horn-raking.

Sir Thomas Dugdale, Minister of Agriculture, promised to consider proposals that would be made to him by the Federation, but insisted that they must not involve great use of manpower. He attached particular importance to efforts to control the warble fly, but remedies were not easy. The answer lay with scientists, who by research might find ways of dealing with the fly before it did damage to cattle.

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

INFLUENCE OF NUTRITION ON REPRODUCTIVE EFFICIENCY IN CATTLE

Sir,—The relationship of nutrition to reproduction in farm animals is of such economic importance that the recent paper of Hignett and Hignett in *The Veterinary Record* of April 5th is the more welcome on that account. In the article there are, however, a number of points of detail and of interpretation upon which more information might perhaps be asked of the authors: the data are doubtless available in the experimental records.

In the first instance, was the loss of appetite, the oedema and unthriftiness at the beginning of the trials a general effect? If not, which were the particular heifers which were most seriously affected?

Secondly, since semen from nine different bulls was used for the insemination of the 23 heifers, is it not possible to provide more specific information on this important aspect of the problem?

One wonders, too, what was the experimental evidence for the statement that the generally unsatisfactory conception rate "might have been due to a deficiency of one or more other essential nutritional factors, *e.g.*, certain amino-acids." Why also was the ration said to be liable "to produce thyroid dysfunction"? Was there evidence of the presence of goitrogens, for example?

Possibly I have misinterpreted two phrases which appear on page 205, since it seems difficult to reconcile them: (a) "the information collected appears to indicate quite clearly that for satisfactory fertility in the housed heifer one should aim at a minimum daily P_2O_5 intake of about 50 grammes." [Col. 1] and (b) "the conception rate of the small number of heifers, even with a higher phosphorus intake, was far from satisfactory." [Col. 2.].

In a subject of such complexity as reproduction, the difficulties of experimental approach are so considerable that, from the biochemical aspect alone, the chance of the appearance of false correlations is by no means small. It is possible that such a case may be found in the paper in question. Hignett and Hignett gave phosphorus at different dietary levels to their 23 heifers (each of which was designated by a letter of the alphabet) and then observed the responses of the animals to insemination. In the two upper rows of Table I are set forth the letter of indication of the heifer, together with either "P," signifying pregnancy after a first insemination, or "(P)," where three inseminations were necessary, or "N" where insemination failed. The order of the heifers is that of decreasing phosphorus intake.

In the lower two rows of Table I is the present writer's arrangement of the results. The distribution of pregnancies is not appreciably different from that of Hignett and Hignett, but the arrangement of the heifers is based simply on the date of first insemination.

TABLE I
(From the data of Hignett and Hignett)

	Order of decreasing phosphorus intake
Heifer	g f c n l j t q o k h e d a w r m i s p v u b
Response	P N P(P)P P P P N N N N (P)P N N N(P)NNN(P)N
Response	P P P (P)P P N N(P)N(P)N N N P N N P N N(P)NN
Heifer	c l g n q t f m u v i r b w j e o a k p d h s
	Chronological order of first insemination.

Order of insemination seems just as good a guide to response *in these experiments* as is phosphorus intake: which then is the correct correlation? Is either of them, or is it a different technical aspect of insemination?

Recently the writer has presented evidence of the influence of vitamin D intake on the health of livestock, not because the vitamin is more important than other nutrients but because, so far as solar irradiation is concerned, the data show the latitude and climate of Britain to be unhelpful to productive animals. The data of Hignett and Hignett could have been used equally well to illustrate the effects of such influences. For example, the insemination of the first seven heifers was carried out during the period 19.9.49 to 13.2.50, namely in the few months immediately following the long and brilliant summer of 1949. The remaining animals must have been housed or have been out of doors during the poor summer of 1950, prior to their insemination during the winter months of 1950-51. No evidence presented by the authors seems to be contrary to such an hypothesis: more detailed histories of the heifers would have been helpful

The study of fertility, it will doubtless be agreed, involves infertile as well as fertile animals. On that account Table V of Hignett and Hignett appears rather misleading, for it refers only, apparently incorrectly, to pregnant heifers. If one compares it with Table IV one finds included five more pregnancies for 15 less inseminations. Now at each end of Table V efficiency of insemination seems rather poor, *e.g.*, on 17 grammes of P_2O_5 per day, one pregnancy for nine inseminations is recorded and on 163 grammes the figures are two pregnancies for five inseminations. Towards the centre of the table the situation appears better. That, however, is largely because four heifers, on 46 grammes of P_2O_5 per day and with no pregnancies out of 12 inseminations, are not included, whereas four new cases of heifers, with four pregnancies in five inseminations, are listed. The full list seems to be as follows:—

P_2O_5 gm. per day	Number of pregnancies	Number of inseminations	Insem./ pregnancy
17	1	9	9·0
34	0	6	
39	1	12	12·0
43	4	5	1·2
46	2	19	9·5
49	2	2	1·0
53	1	1	1·0
185	3	5	1·7
163	2	5	2·5
	Total 16	64	

The statement concerning the effects of dosage with calciferol seems only to mean that some animals did respond—and some did not. But there is no indication as to which animals were dosed. Did they include the re-treated heifers, b, f, m, r, v and w?

The writer can only suggest that the results are likely to remain inconclusive save when (a) the basal diet is adequate in all respects save phosphorus, calcium and vitamin D, (b) the experimental animals initially possess equal reserves of vitamin D and (c) there is rigid control of intake, at selected levels, of the three nutrients listed above. Until that has been done, the complication of the problem by hypotheses of other "complexes" seems likely to do more harm than good.—Yours faithfully, JOHN T. ABRAMS, Royal Veterinary College and Hospital, Camden Town, London, N.W.1. *April 7th*, 1952.